

# INSULATION TESTER

## MANUAL

### 1. General

- This Instrument is an intelligent micro-insulation tester, which can measure parameters such as insulation resistance and voltage, with features of stable performance and user-friendly operation.
- The design conforms to the following safety requirements:  
DL/T 845.1 General specifications for measuring resistance equipment Part 1: electronic insulation resistance meters.  
JJG 1005 Verification Regulation of Electronic Insulation Resistance Meters.
- Insulation measurement voltage in large ranges: 250V, 500V, 1000V.
- Insulation resistance measurement as high as 5GΩ.
- Automatic voltage release function.
- White backlight function to view the test results in dimly areas.
- The actual output voltage value and the measured insulation resistance value are displayed at the same time.
- The test switch has a locking function.
- Voltage test and alarm function of the tested object.
- The instrument employs panel calibration technology, by which the instrument connects to standard device, undertakes the panel calibration in accordance with the procedure, stores the relevant calibrated data and finish stipulated periodical calibration to ensure the instrument reaching its accuracy and features.
- It is suitable for on-site use with a hand rope for and easy man-machine operation.
- It can be powered by AC power adapter without taking out the battery.

### 2. Open-case Inspection

Check the product to see whether it is damaged during the shipment or not. Check the accessories to see whether they are the same as shown in the packing list and keep the packing materials for late delivery.

Standard and optional accessories supplied are listed as follows. Optional ones should be bought separately according to your requirement.


Standard accessories:




- 1 pair of test lead with alligator clip
- 1 pc user's manual
- 8pcs 1.5V Alkaline (LR6) batteries
- 1 Hand rope

Optional accessories (additional cost required): power adapter (DC12V)

### 3. Safety Information


The design, manufacture and test of the Instrument reach the IEC 61010-1, IEC61557-1, and IEC61557-2 Safety Requirements. This Manual contains warnings and safety regulations that must be followed to ensure safe operation and retain the Instrument in safe condition. Read the following instructions before operation.

Mark  in the Instrument means the operator needs to refer to related parts in the Manual to ensure safe operation.

-  Danger is reserved for conditions and actions that will cause serious or fatal injury.
-  Warning is reserved for conditions and actions that may cause serious or fatal injury.
-  Caution is reserved for conditions and actions that can cause injury or instrument damage.

 Warning


- Read carefully and make sure well understanding of the Manual before using this Instrument.
- Follow the instructions in the Manual whenever operating, keep the Manual in good condition for reference whenever necessary.
- Mis-operation may cause accidents and damages to the Instrument in measurement.
- Never attempt to make any measurement if any abnormal conditions, such as a broken cover or exposed metal parts are present on the Instrument and Test Leads.
- Replace Test Lead with new one in same model and same electrical specification when it is broken.
- Do not replace batteries if the Instrument is wet.
- Ensure that the Test Leads are firmly inserted into the terminals.
- Ensure that the Instrument powers off when the battery cover is open.

 Danger







- Never make measurement on a circuit in which electrical potentials exceeding AC1000V/DC1500V.

- Do not attempt to make measurement in the presence of flammable gasses. Otherwise, the use of the Instrument may cause sparking, which can lead to an explosion.
- Never attempt to use the Instrument if its surface or your hands are wet.
- Do not exceed the maximum range allowed.
- Do not press the PRESS TO TEST key before connecting the Test Leads.
- Never open the battery cover during a measurement.
- Cut off the power and remove any measuring parts connected to the Instrument before opening the battery cover.

**⚠ Caution**

- Set and ensure the Range Switch to the appropriate position before making measurement.
- Power off the instrument and remove the test lead after use.
- Remove the batteries if the Instrument is to be stored and will not be in use for a long period.
- When see the symbol  on the display, it indicates low batteries and you should replace it in time.
- Do not use or keep the Instrument in high-temperature, high-humidity, explosive, strong electromagnetic and dewy environment or expose to direct sunlight.
- Do not use abrasives or solvents. Use a damp cloth with neutral detergent for cleaning the Instrument.
- Do not store the Instrument if it is wet. Store it after it dries.

## 4. Symbols

	possible danger of electronic shock		warning
	earth ground		direct current
	alternating		double insulated

## 5. Technical Specification

### Safety and Conformity

Overload Protection	Insulation resistance function: AC1200V/10 seconds; voltage function: AC1000V/DC1500V/10 seconds
Legal Conformity	IEC61010-1(CAT III 600V,POLUTION degree II) IEC61557-1,2(electronic safety requirements for low voltage distribution system below AC 1000V and DC 1500V)
Electromagnetic Compatibility	conforms to IEC61326-1,Group 1,Class B
Surge Protection	6kV (as per IEC61010.1-2001)

### General Feature

Display Screen	digit: displays in 5000 digits; white backlight
Operation Temperature and Moisture Range	0~40 °C, relative moisture≤85%(no condensation)
Storage Temperature and Moisture Range	-20°C~60°C,relative moisture≤90%( no condensation)
Accuracy Required Temperature and Moisture Range	23±5°C,relative moisture≤75%( no condensation)
Ambient Condition for Operation	Indoor, outdoor operation(no waterproof),at an altitude of 0~2,000 meter
Indicator for Over-range	Voltage: OL Insulation resistance: > 0.999G / >1.99G / >4.99G
Battery Type	8* 1.5V Alkaline (LR6) batteries
Low Battery	displays battery symbol
Automatic Power-off	The default value is 15 minutes if no operation
Closed – case Calibration	no internal adjustments needed
Size	178(L)×110(W)×59(D)mm
Weight	about 600g
Calibration Period	One year

## Measurement Range and Accuracy

Error limits are given as:  $\pm$ ( [ % of reading ]+[ number of least significant digits ]),warranty for one year. (Note: 'number of least significant digits' means the digits increased or decreased in least significant digits)

Ambient temperature:  $23\pm 5^{\circ}\text{C}$  ; Ambient humidity: 45~75%RH

## Insulation Resistance Measurement (RISO)

Rated voltage	Measurement range	Resolution	Open-circuit voltage	Fall-off resistance	Accuracy
250V	0.400M $\Omega$ ~1.999M $\Omega$	0.001M $\Omega$	DC 250V +20% -0%	0.3M $\Omega$	$\pm$ (5%+5)
	2.00M $\Omega$ ~19.99M $\Omega$	0.01M $\Omega$			
	20.0M $\Omega$ ~199.9M $\Omega$	0.1M $\Omega$			
	0.200G $\Omega$ ~0.999G $\Omega$	0.001G $\Omega$			
(When the resistance value of the measured object is less than 0.400M $\Omega$ , the meter can still do the measurement, but the test result can only be used as reference. When the resistance value of the measured object > 0.999G $\Omega$ , the meter continuously displays ">0.999G $\Omega$ ")					
500V	0.600M $\Omega$ ~1.999M $\Omega$	0.001M $\Omega$	DC 500V +20% -0%	0.5M $\Omega$	$\pm$ (5%+5)
	2.00M $\Omega$ ~19.99M $\Omega$	0.01M $\Omega$			
	20.0M $\Omega$ ~199.9M $\Omega$	0.1M $\Omega$			
	0.200G $\Omega$ ~1.99G $\Omega$	0.01G $\Omega$ -0.001G $\Omega$			
(When the resistance value of the measured object is less than 0.600M $\Omega$ , the meter can still do the measurement, but the test result can only be used as reference. When the resistance value of the measured object >1.99G $\Omega$ , the meter continuously displays ">1.99G $\Omega$ ")					
1000V	0.800M $\Omega$ ~1.999M $\Omega$	0.001M $\Omega$	DC 1000V +20% -0%	0.6M $\Omega$	$\pm$ (5%+5)
	2.00M $\Omega$ ~19.99M $\Omega$	0.01M $\Omega$			
	20.0M $\Omega$ ~199.9M $\Omega$	0.1M $\Omega$			
	0.200G $\Omega$ ~4.99G $\Omega$	0.01G $\Omega$ -0.001G $\Omega$			
(When the tested resistance is less than 0.800M $\Omega$ , the meter can still do the measurement, but the test result can only be used as reference. When the resistance value of the measured object >4.99G $\Omega$ , the meter continuously displays ">4.99G $\Omega$ ")					

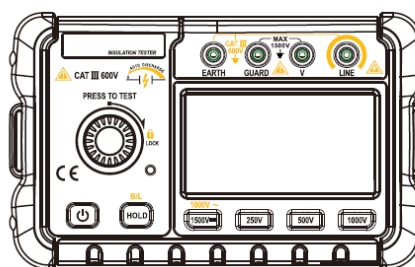
- Short circuit measurement current  $\geq 1$  mA
- Automatic discharge time: 1 second.
- Live test is prohibited, if the terminal voltage is bigger than 30V during the test, the alarm will be prompted.

## AC/DC Voltage Measurement

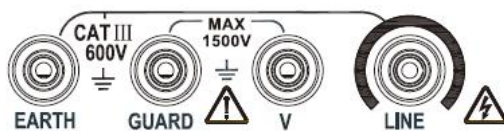
Measurement function	DC voltage	AC voltage
Measurement range	$\pm$ (20~1500)V	20~1000V(45~1kHz)
Resolution ratio	1V	
Accuracy	2%+3	
Input impedance: 10M $\Omega$ .		Measurement speed rate: about 2 times / s

## 6. Instrument Layout

### Instrument Body

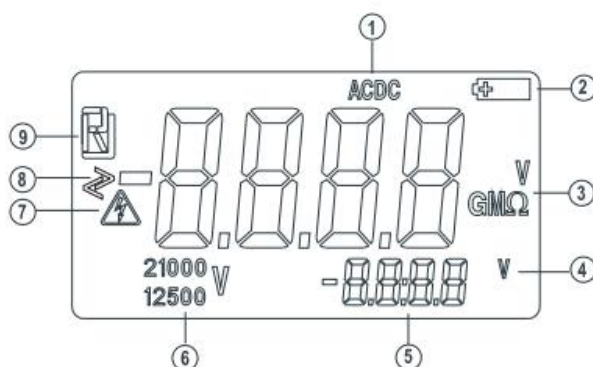


## Terminals



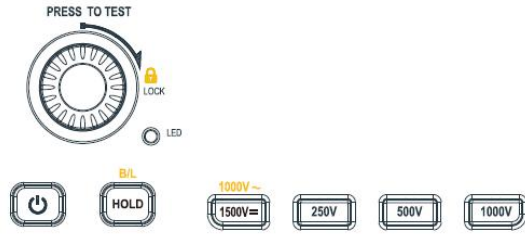
Terminal	Illustration
LINE	voltage output terminal
V	voltage measurement terminal
GUARD	protection terminal
EARTH	earth ground terminal

## Display



No.	Mark and information	Illustration
1	ACDC	AC voltage, DC voltage
2		Low battery symbol
3		Unit in the main display area: V, MΩ, GΩ
4		Auxiliary display area unit: V (volts)
5		Auxiliary screen
6		Display part of insulation voltage range: 250V, 500V, 1000V
7		High voltage symbol displays when voltage is higher than 31V
8		Main screen
9		insulation resistance

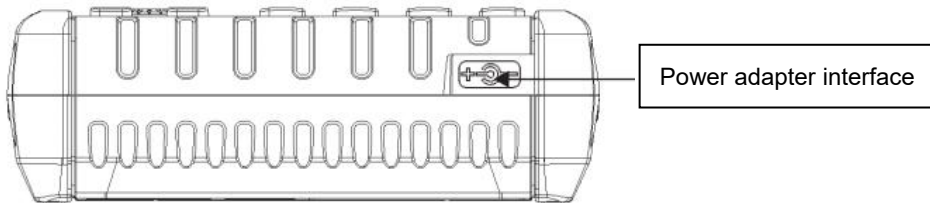
## Buttons



Press key	Illustration
	Power key: Press this key for more than 2 seconds to turn on/ off the Instrument.
	Data hold / backlight key: press this key for more than 2 seconds to turn on and off the backlight (the backlight will stay on until it automatically shuts down); press this key for less than 2 seconds to hold the data.
	Press to select measurement functions: AC/DC voltage measurement, default AC voltage measurement when turn it on. Max. measurement range AC 1000V, DC 1500V.
	press to select output voltage range: 250V
	press to select output voltage range:500V
	press to select output voltage range:1000V
	Press to start measurement once Long press (or lock) to start continuous measurement; loosen (or unlock) to stop measurement.

### Use the power adapter

Open the soft rubber cover on the side of the instrument, and insert the DC 12V special power adapter of the instrument into the power socket (the instrument must be turned off when inserting or pulling out the special power adapter; It is better to remove the batteries if you want to use the power adapter).



## 7. Preparation before Measurement

### Power-on

To turn on the Instrument, press key for more than 2 seconds to connect with the power.

To turn off the Instrument, press key for more than 2 seconds to cut the power.

When being powered-on, the Instrument starts inner-self diagnose and displays power-on mark firstly, and then undertakes relevant operations.

#### Note



**Power-on: to guarantee the operation of the connection to the electronic, cut off the power for 5 seconds before restarting.**

### Automatic Power-off

Without any operation (not including measurement key "TEST") in 15 minutes, the Instrument will automatically power off.

### Turn on the Data hold / Backlight


After power on, press key to turn on the data hold function, the "H" character appears on the screen of the instrument, and the test

data is latched at the same time; long press  key for more than 2 seconds to turn on the backlight, and long press  key again for more than 2 seconds to turn off the backlight.


### Automatically Turning off the Backlight

The Instrument will automatically turn off the backlight if Users do not turn off the backlight within 15 minutes.

### Low Battery Display

When the symbol "" displayed on the screen, it means the battery is lack of power, please replace the batteries with new ones.

#### Warning

To avoid electrical shock hazard or personnel injury due to wrong readings, replace the batteries as soon as possible if the screen displays  symbol, or charge the batteries if they are chargeable.

### Connect the test Leads

Firmly insert the Test Leads into the instrument terminals, connect the Test Lead(red) to the LINE terminal, the protection wire(black) to the Guard terminal(if necessary),and the Earth Wire (black) to the EARTH terminal.

#### Danger

When pressing the measurement key under insulation resistance measurement, the Test Lead will produce high voltage, and may cause electrical shock if touching.


## 8. Start the Measurement

### Voltage Measurement

#### Danger

- To avoid electric shock, do not measure under the loop circuit which earth voltage is higher than DC/AC 600V/1000V. Do not measure even if the internal voltage is below 600V/1000V but the earth voltage is higher than 600V/1000V.
- When measuring voltage of electric line with large current, the measurement must be done in the secondary circuit of the circuit breaker, otherwise it may cause personal injury.
- When measuring voltage, please pay attention to avoid the short circuit of the metal part of the Test Leads and loop circuit, which may cause electric shock.
- Do not undertake measurement when the battery cover is opened.

(1) When turning the Instrument on ,press  key to connect with the power;

(2) Press  key to select DC/AC voltage measurement functions(DC/AC displays on the Screen)

(3) Insert the red Test Lead into 'V' terminal and black Test Lead to 'G' terminal.

(4) Insert the red and black probes into the circuit under measurement, when measuring the DC voltage, the symbol '-' displays on the

LCD if the voltage of the red lead is negative. The symbol  displays when the measurement value  $\geq 30V$  or  $\leq -30V$ .

**Note** : Do not need to press the test key(PRESS TO TEST) to measure the voltage.

### Insulation Resistance Measurement

#### Danger

- Before measurement, make sure no electricity exits in the circuit under measurement; do not measure electrophorus equipment or insulation of electrophorus wire.
- The users must wear high voltage insulating gloves.
- In insulation resistance measurement, the Instrument outputs dangerous voltage, thus the users must be careful and make sure the measured object has been firmly clipped, and press the measurement key to output high voltage after moving your hands away.
- Do not undertake measurement when the battery cover is opened.

#### Warning

- Do not short circuit the two test probes under high voltage output state or measure insulation resistance after high voltage output, which will produce flame, cause fire and damage the Instrument.

#### Note

- Due to different measured objects, the insulation resistance value may be unstable, or cause the displayed resistance value unstable.
- Insulation impedance may make some beeping sounds during measurement, which is not a stoppage.
- Capacitive load measurement may cost long time.

When measuring insulation resistance, the voltage of measurement terminals output from the positive polarity of EARTH terminal to the negative polarity of TEST terminal. During measurement, earth test lead connects to the EARTH terminal, usually when users make ground measurement of insulation, connect one end of the testing object to the earth, method of connecting earth terminal to the positive polarity could obtain low resistance value, and is most available for detecting defective insulation.

- (1) Make sure the measured circuit has been fully released, and isolated from the power circuit. Shift the function to the necessary insulation resistance range.
- (2) Press 250V /500V/1000V key to select insulation resistance measurement function(R displays on the left upper corner of the Main Screen) ;
- (3) Insert the red Test Lead into 'LINE' terminal and black Test Lead to 'EARTH' terminal.
- (4) Insert the red and black probes into the circuit under measurement.
- (5) Press measurement key to do the test.
- (6) The Instrument designed with auto-discharge function. When finishing the measurement, do not take off the test leads, release the measurement key and make the Instrument discharge the voltage produced in measurement automatically.

**⚠ Danger**

- Do not touch the circuit immediately after measurement. The stored charge in the circuit may cause electric shock.
- Do not take off the test leads immediately, wait until the discharging work is finished then you can touch the circuit.

**Continuous Measurement**

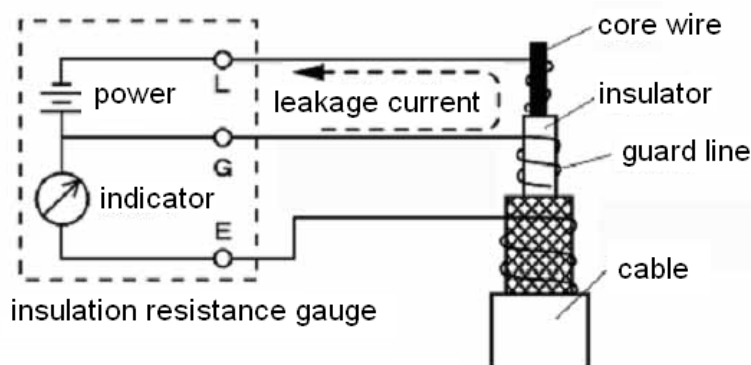
When continuous measuring the insulation resistance, press the measurement key and switch towards the right side, lock the measurement key to enter continuous measurement mode. When the measurement is finished, switch the measurement key towards the left to restore the original position.

**⚠ Danger**

The head part of Test Leads may produce high voltage when measuring, please note to avoid electric shock.

**Use of Guard Line**

When measuring the insulation resistance of cables, the leakage currents in the cover join with the current through the insulator interior, which cause the errors of insulation resistance value. To avoid this phenomenon, use the guard line (any conductive naked wire)to roll up the leakage current carrying part, and connect to the protection terminal, the leakage current won't carry through the indicator, thus only the volume resistance of the insulator could be measured.



Please use the attached guard line to connect protection terminal.

**9. Instrument Maintenance**

This section provides some basic maintenance procedures. Repair, calibration, and servicing not covered in this manual, must be performed by qualified personnel. For maintenance procedures not described in this manual, contact a Service Center.

**General Maintenance**

- Periodically wipe the case with a damp cloth and detergent; do not use abrasives or solvents.

- Take out the batteries if the Instrument will not be used for a long time.
- Dirt or moisture in the terminals can affect readings.

**Clean the terminals as follows:**

- (1) Turn the Instrument off and remove all test leads.
- (2) Shake out any dirt that may be in terminals.
- (3) Soak a new swab with alcohol to lean each terminal.

**Replacing the Batteries**

This Instrument is powered by eight AA alkaline batteries (LR6).

**⚠ Warning**

To avoid electrical shock or personal injury:

- Remove Test Leads from the Instrument before opening the battery door.
- Close and latch the Battery Cover before using the meter.

**⚠ Note**

- The new and old Batteries cannot be mixed.
- Make sure the battery's poles are in accordance with the marks illustrated in battery pool when replacing them.
- Take out the batteries if the meter will not be used for a long time.
- Dispose the old batteries in accordance with the local law.

**Replace the batteries as follows :**

- (1) turn off the Instrument and remove all Test Leads from the Terminals;
- (2) Remove the battery cover by using a standard-blade screwdriver to turn the battery door fasteners, and then take off the battery case
- (3) Replace with new batteries and reinstall the battery case and tighten screws.

**Appendix**

**Insulation Resistance Measurement Principal**

Voltammetry, DC voltage excitation output, measurement of excitation voltage and leakage current.

Operation principal:  $\text{resistance} = \text{voltage} / \text{current}$   $R_X = V/I$

